COMPACT INTEGRATED SOLID OXIDE FUEL CELL SYSTEM

ABSTRACT OF THE DISCLOSURE

A compact integrated solid oxide fuel cell power system includes a fuel cell stack, two stages of heat exchange, and a thermal enclosure. The system includes a recuperator which exchanges heat between exhaust gas, heated by oxidizing unspent gases from the fuel cell stack in a combustion chamber, and incoming oxidant to pre-heat the oxidant. The solid oxide fuel cell stack has an internal manifold which exchanges heat between incoming fuel and the pre-heated oxidant. System components are enclosed by thermal insulation. The system may also include a catalytic partial oxidation reformer to pre-heat the fuel during start up. The system can also include an air compressor, fuel storage tank, and pressure relief valve, providing a portable power system. The air compressor can be used to pressurize the incoming oxidant to the SOFC stack, and to pressurize the fuel storage tank using the pressure relief valve as a pressure regulator.